

Essential Question: What must be analyzed to determine if an equation is linear?
Essential Vocabulary: equation, standard form, constant, x-intercept, and y-intercept linear

Graphing Linear Equations

linear equation: an equation that forms a line when graphed.

standard form: $Ax + By = C$, where A, B, and C are whole numbers and A is always positive. (no fractions or decimals)

constant: a number without a variable (the C from the standard form is a constant)

x-intercept: where a graph crosses the x-axis ($\#, 0$)

y-intercept: where a graph crosses the y-axis (0, #)



To determine if an equation is a linear equation the following must be true

1. no exponents
2. no variables are multiplied together

All linear equations can be written in standard form.

Ex. 1 Determine if the following represent linear equations. If yes, write the equation in standard form.

a.) $x = y - 5$ b.) $5x + 3 = xy + 2$ c.) $\frac{3}{4}x = y + 8$

You do!!

$$1.) y = x^2 - 4$$

$$2.) \frac{1}{4}x + y = -1$$

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3-3

Rate of Change and Slope

CCSS

F.IF.6 Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.

F.LE.1a Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.

Mathematical Practices

2 Reason abstractly and quantitatively.

Essential question: What parts of a line must be analyzed to find the rate of change?

Essential Vocabulary: Slope, Rate of Change

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Navigation icons

3-3

Rate of Change and Slope

KeyConcept

Rate of Change

If x is the independent variable and y is the dependent variable, then

rate of change = $\frac{\text{change in } y}{\text{change in } x} = \text{slope}$

Cause

Effect

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LESSON3-3

Rate of Change and Slope

Real-World Example 1

DRIVING TIME Use the table to find the rate of change. Explain the meaning of the rate of change.

Time Driving (h)	Distance Traveled (mi)
x	y
2	76
4	152
6	228

ex. 2

Find the rate of change if for every 25 students there must be a chaperone and for every 100 students there must be 4 chaperones.

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LESSON3-3

Rate of Change and Slope

Key Concept Slope

Words The slope of a nonvertical line is the ratio of the rise to the run.

Symbols The slope m of a nonvertical line through any two points, (x_1, y_1) and (x_2, y_2) , can be found as follows.

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$y_2 - y_1$ ← change in y

$x_2 - x_1$ ← change in x

Graph

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Example 3 Find the rate of change represented by the graph.

a.

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Example 3 Find the rate of change represented by the graph.

b.

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LESSON3-3

Rate of Change and Slope

Ex. 4

A. Determine whether the function is linear. Explain.

x	y
1	6
2	12
3	18
4	24

Really asking "Is there a constant rate of change?"

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LESSON3-3

Rate of Change and Slope

Checkpoint

B. Determine whether the function is linear. Explain.

A. Yes, the rate of change is constant.

B. No, the rate of change is constant.

C. Yes, the rate of change is not constant.

D. No, the rate of change is not constant.

x	y
5	2
10	4
15	6
20	8

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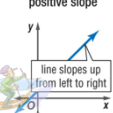
LESSON3-3

Rate of Change and Slope

ConceptSummary

Slope

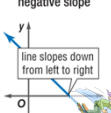
positive slope



line slopes up from left to right

The function values are increasing over the entire domain.

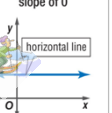
negative slope



line slopes down from left to right

The function values are decreasing over the entire domain.

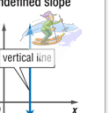
slope of 0



horizontal line

The function values are constant over the entire domain.

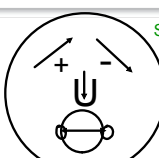
undefined slope



vertical line

The relation is not a function.

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LESSON3-3

Rate of Change and Slope

Ex. 5

A. Find the slope of the line that passes through (-3, 2) and (5, 5).

B. (-3, -4) and (-2, -8).

C. (-3, 4) and (4, 4).

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LESSON

3-3

Rate of Change and Slope

Ex. 7

A. Find the value of r so that the line through $(6, 3)$ and $(r, 2)$ has a slope of $\frac{1}{2}$.

B. Find the value of p so that the line through $(p, 4)$ and $(3, -1)$ has a slope of $-\frac{5}{8}$.

EXIT

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Slope-Intercept Form

Essential Question: Can you judge what is needed to graph using slope-intercept?

Essential Vocabulary: slope-intercept form, constant function

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SLOPE-INTERCEPT FORM OF THE EQUATION OF A LINE

The linear equation $y = mx + b$ is written in **slope-intercept form**. The slope of the line is m . The y-intercept is b .

$y = 2x + 3$
Slope is 2 .
y-intercept is 3 .

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Constant Function: $y = b$ also known as a horizontal line

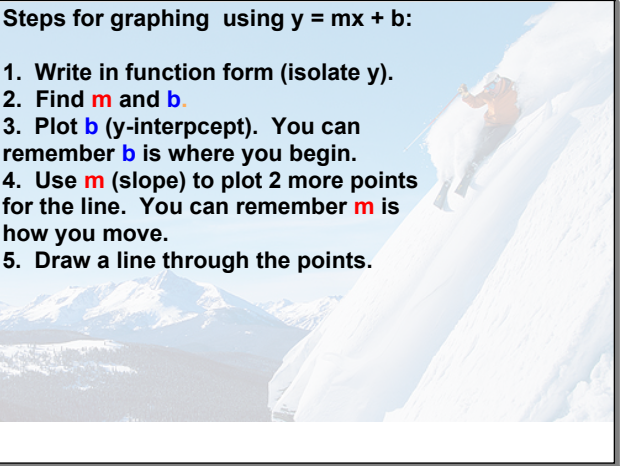
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Ex. 1 Write an equation of a line with the given slope and y-intercept.

- a.) $m = \frac{1}{4}$, $b = 13$
- b.) $m = 0$, $b = 1$
- c.) $m = 0.4$, $b = -0.6$
- d.) $m = 4$, $b = 0$

Steps for graphing using $y = mx + b$:

1. Write in function form (isolate y).
2. Find m and b .
3. Plot b (y-interpcept). You can remember b is where you begin.
4. Use m (slope) to plot 2 more points for the line. You can remember m is how you move.
5. Draw a line through the points.



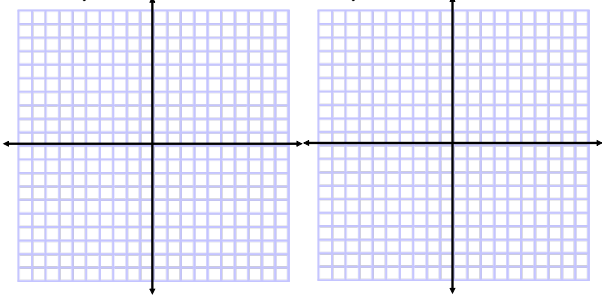
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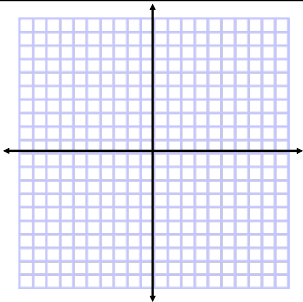
Ex. 2 Graph each equation.

a. $y = -2x + 1$

b. $y = 4$



c. $-4x + y = 2$



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Your turn to practice graphing.
Using graphing paper turn to page 384 and
doe exerices # 1-10

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